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(54) Stuffing boxes

(57) In a stuffing box arrangement, to provide for automatic resetting of the packing (4), spring elements (11) are interpositioned between screw nuts (10), and the stuffing box gland (6).

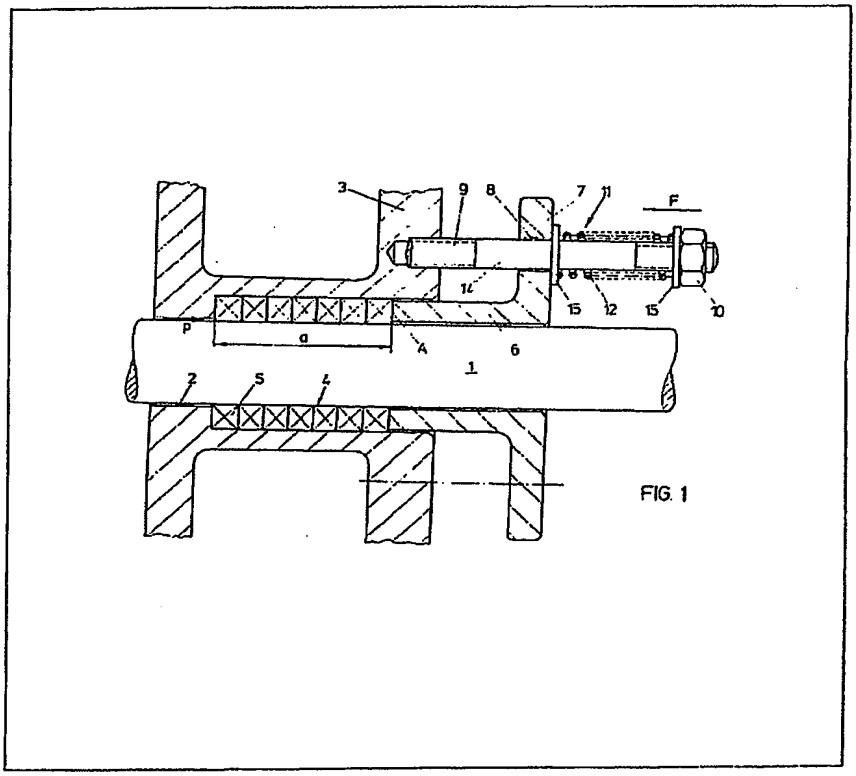

FIG. 1

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The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy

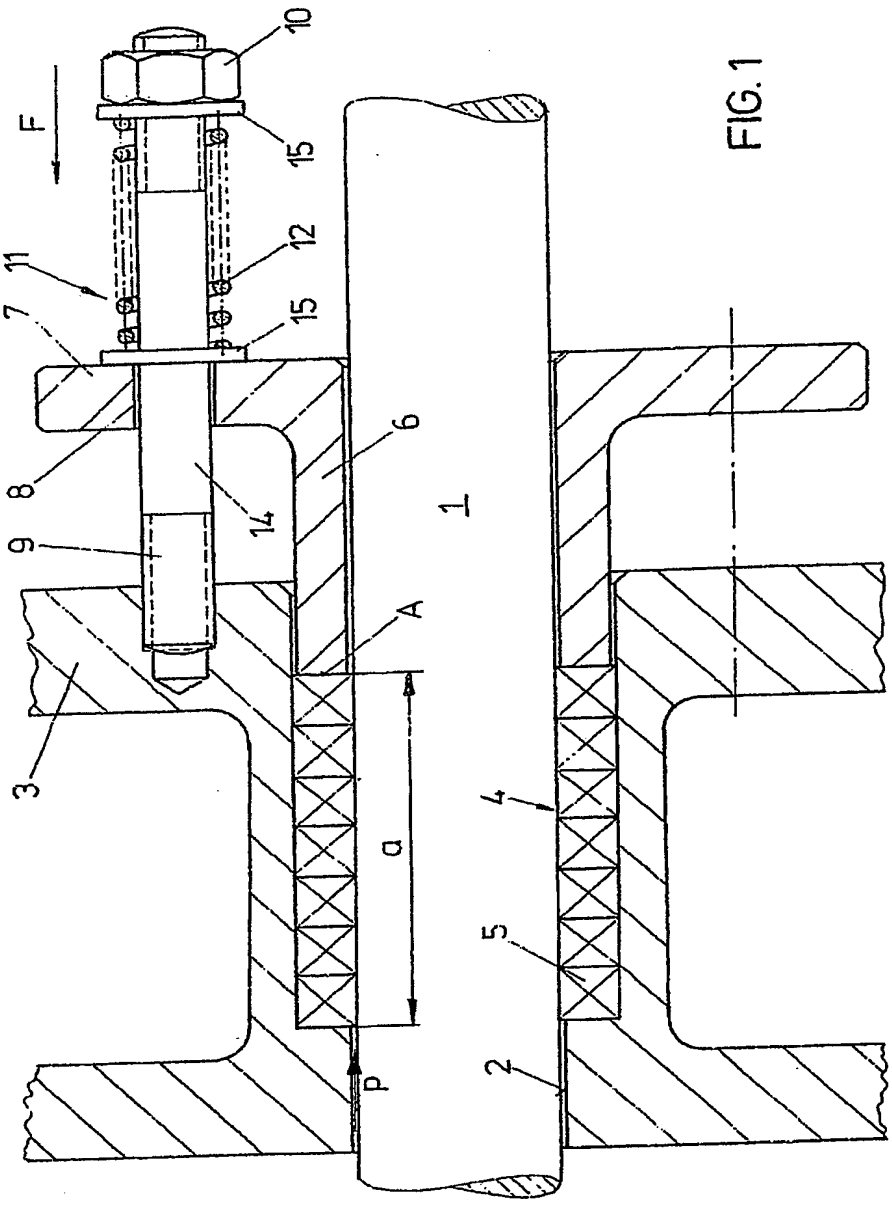

FIG. 1

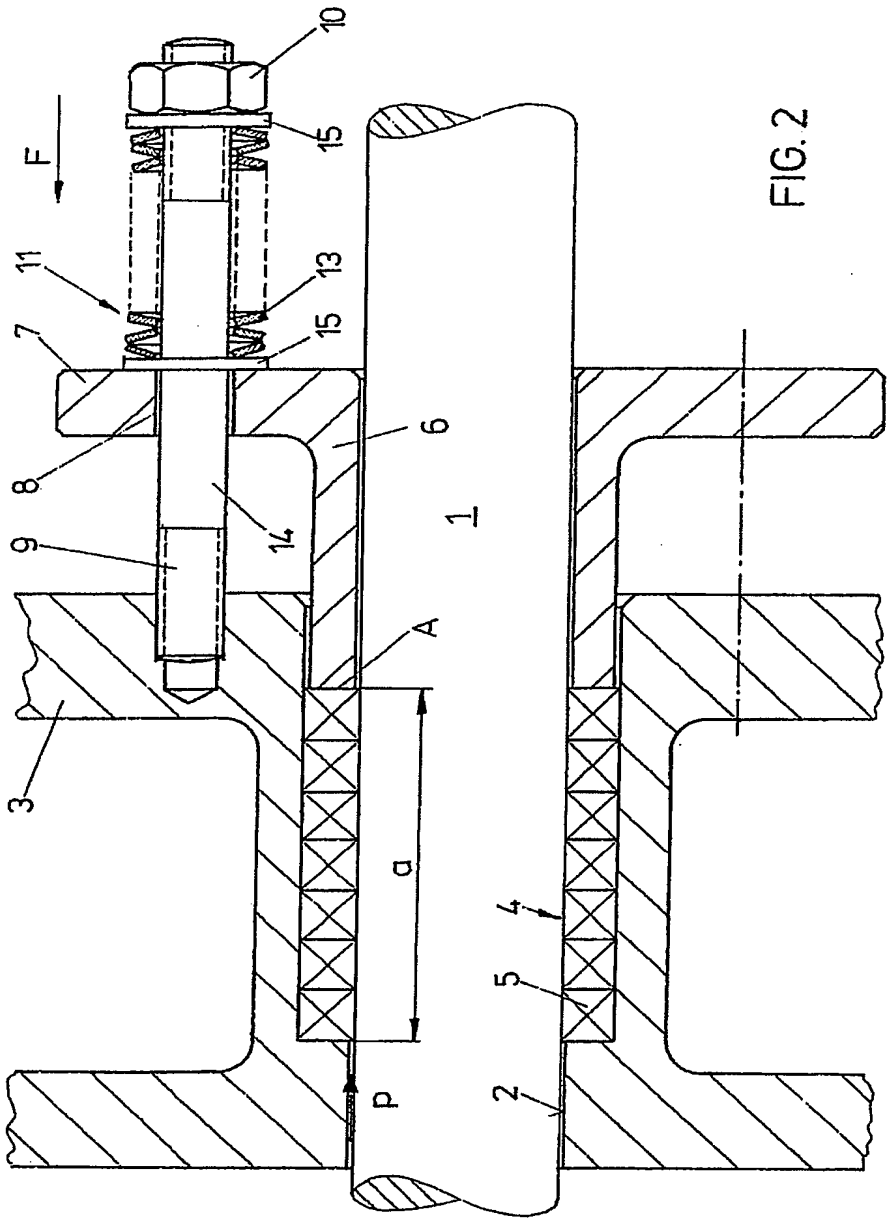

FIG. 2

SPECIFICATION

A packing box arrangement

The present invention refers to an adjustable packing box arrangement for sealing movable machine parts, particularly rotating shafts, within a through-passage, a packer being pressed in axial direction of the through-passage by a packing box gland, the packing box gland embracing threaded bolts inserted into the constructional part comprising the through-passage and the packing box gland being tensioned by screw nuts screwed onto said threaded bolts. In known packing box arrangements of the mentioned type, the packing box becomes untight during operation and leakage losses are occurrying so that such packing box arrangements need frequent servicing. Such frequent servicing is particularly required after interruption of operation and on account of fluctuations of temperature or pressure. When using packing boxes for rotating shafts, the packing of the packing box is severely stressed with shafts having a concentricity error.

It is now an object of the present invention to avoid these drawbacks and to prolong the servicing intervals with packing boxes. The present invention now essentially consists in that spring elements are interpositioned between the screw nuts and the packing box gland, said spring elements preferably being formed of stacked cup springs or helical springs known per se. The CH-PS 575 088 describes a packing box arrangement in which the packing of the packing box is adjustable under the action of spring pressure. In this known arrangement, the packing box is inserted into a tubular machine part and an annular housing is connected with the packing box gland, said annular housing being put over the tubular machine part and being supported against this tubular machine part with interposition of spring elements. Such a construction is, on the one hand, very expensive and, on the other hand only practicable if the packing of the packing box is arranged within a tubular machine part. In cases in which the packing box gland shall be forced against a plane surface, such a construction is not possible and a usual packing box arrangement can not be replaced by such a packing box arrangement. In view of the spring elements being, according to the invention, arranged between the screw nuts and the packing box gland, each usual packing box arrangement can be made resiliently adjustable without requiring any change of the construction. Such a resiliently adjustable packing box arrangement has the advantage that the pressure acting on the packing of the packing box can be maintained over an extended time of operation without requiring frequent servicing, thereby substantially prolonging the servicing intervals. Furthermore, an optimum pressure acting on the packing of the packing box can be adjusted in view of the packing box gland being resiliently pressed against the packing of the packing box, thereby also avoiding any injury of the packing of the packing box by excessive compression. In an arrangement according to the invention, the resetting path of the packing box gland can be given any desired length. The resetting path can have, if desired, such a length that the packing of the packing box can be used till complete wear without any resetting operation. The wear of the packing is, of course, greater for packing boxes used for tightly sealing rotating shafts, because the packing box is subjected to heavier stress with a concentricity error of the shaft than is the case when sealing reciprocating constructional parts such as, for example, piston rods.

According to the invention, the threaded bolts are smooth and not provided with a thread at the area embraced by the packing box gland so that the packing box gland is guided without any restraint and the free adjustment movement of the packing box gland is not obstructed by contact with threads.

Tests have shown that a packing box arrangement according to the invention is suitable for extending under normal operating conditions the servicing intervals up to approximately 8000 operational hours.

The invention is further illustrated with reference to the drawing schematically showing embodiments of the invention.

Figures 1 and 2 show axial sections through packing box arrangements according to the invention.

In the arrangements according to Figures 1 and 2, reference numeral 1 is a shaft or a reciprocating rod, for example a piston rod, which is to be tightly sealed within a constructional part 3 comprising a through-passage 2. Reference numeral 4 designates the packing of the packing box, said packing consisting of rings 5 of sealing material, which rings are stacked one on the other in axial direction. Reference numeral 6 designates the packing box gland which is in usual manner provided with a laterally extending flange 7 provided with bores 8 through which threaded bolts 9 are extending which are screwed into the constructional part 3 comprising the through-passage 2. The packing box gland is pressed against the packing 4 of the packing box by screw nuts 10.

In known packing box arrangements, the nuts 10 are immediately supported against the flange 7. Whenever the packing 4 of the packing box becomes untight the nuts 10 must be tightened. Such servicing operations are required after comparatively short time intervals.

In the arrangement according to the invention, spring elements 11 are interpositioned between the nuts 10 and the flange 7, said spring elements being helical springs 12 in the arrangement according to Figure 1 and stacked cup springs 13 in the arrangement according to Figure 2. These spring elements 11 are continuously resetting the packing box gland and thus are maintaining the required pressure force which has to act on the packing 4 of the packing box.

The threaded bolts 9 are smooth and not provided with any thread at the area 14 embraced by the packing box gland 6, i.e. at the area of the bore 8, thereby avoiding the danger that the packing box gland becomes catched by threads thus making the spring element 11 inoperable. The spring elements 11 are arranged

between supporting discs 15 so that the spring elements are unobjectionably supported and the pressure force can precisely be adjusted. The length of the packing 4 of the packing box is designated *a*.

In the drawing, the pressure acting on the packing is designated *p*, the spring force is designated F and the annular cross section of the packing is designated A.

The criteria of both types of springs are

(a) the fluid pressure acting on the packing,

(b) the available spring path depending on the type of packing (dependent on whether the packing is made of soft material or of hard material or is made up of a different number of packing rings),

(c) the constructional facts (packing box length) and

(d) pressure fluctuations during operation.

The spring sizes are calculated according to the following formula:

p	$(\frac{N}{cm^2})$	=	maximum pressure acting on the packing of the packing box
A	(cm^2)	=	area of the annular cross section of the packing
A		=	$(D^2 - d^2)\frac{\pi}{4}$
F	(N)	=	required spring force
p	$=\frac{F}{A}$	→	F = p.A

The calculated spring force is divided by the number of threaded bolts provided in the packing box, thus obtaining the spring force for one single spring and its specific size.

CLAIMS

1. Adjustable packing box arrangement for sealing movable machine parts, particularly rotating shafts, within a through-passage, a packer being pressed in axial direction of the screw-passages by a packing box gland, the packing box gland embracing threaded bolts inserted into the constructional part comprising the through-passage and the packing box gland being tensioned by screw nuts screwed onto said bolts, wherein spring elements are interpositioned between the screw nuts and the packing box gland, said spring elements preferably being formed of stacked cup springs or helical springs.

2. Packing box arrangement as claimed in claim 1, wherein the threaded bolts are smooth and without thread within their area embraced by the packing box gland.

3. Adjustable packing box arrangement for sealing movable machine parts constructed, arranged and adapted to operate substantially as herein described with reference to, and as shown in, the accompanying drawings.

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